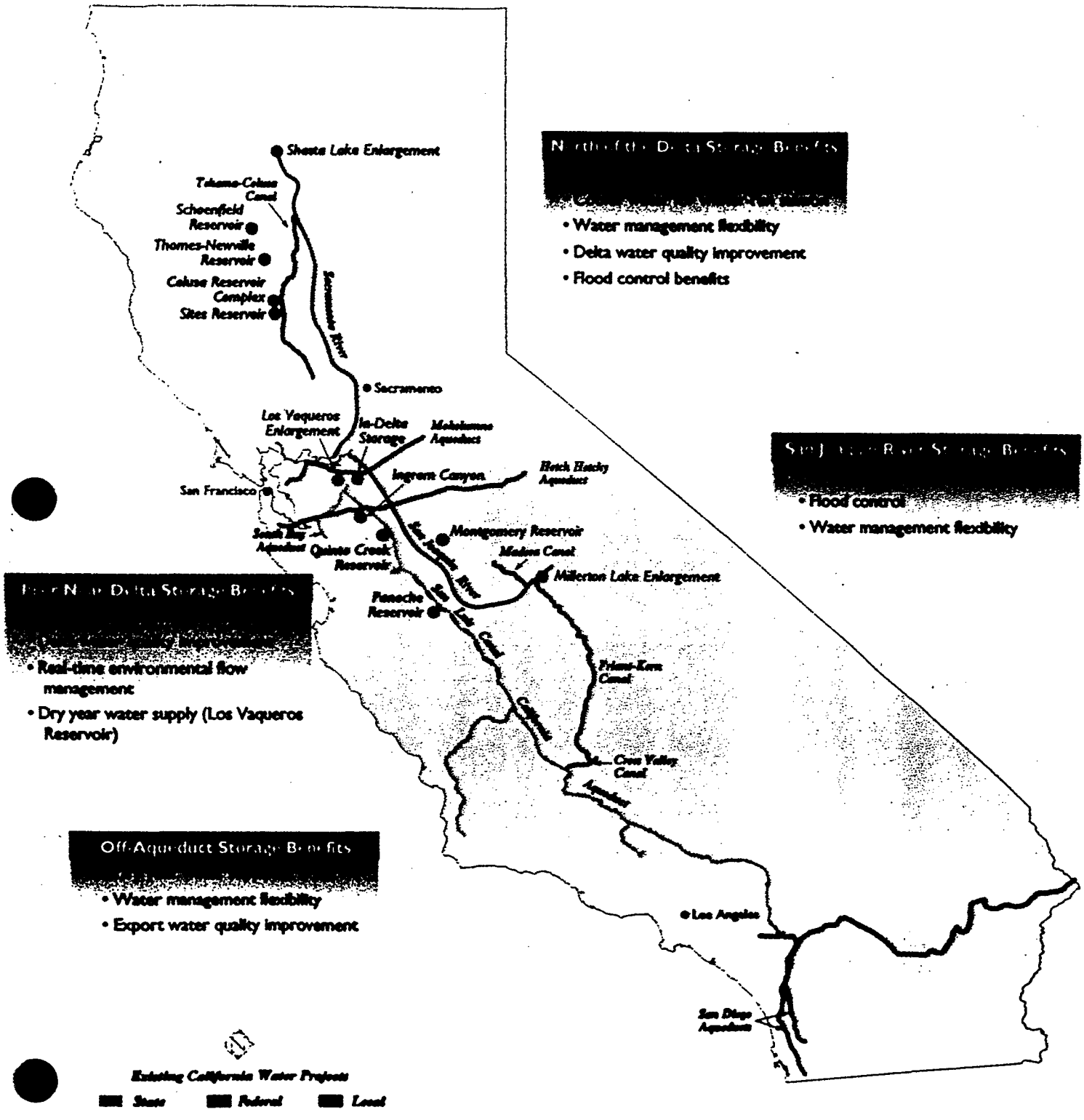
Integrated Storage Investigations

Potential Surface Water Storage Alternatives



CALFED compiled an inventory of 52 potential alternative surface projects for the programmatic Phase II evaluation. While screening remains to be completed, CALFED has narrowed the number of potential alternatives for additional consideration to the 12 shown above.

Water Management Strategy Evaluation Framework

CALFED's Water Management Strategy (WMS) will provide a long-term decision-making framework for evaluating the success of implementation of the water supply reliability tools needed to achieve CALFED's program objectives and solution principles. Tools include CALFED's Water Use Efficiency, Water Transfer, and Water Quality Programs and storage. CALFED has initiated an Integrated Storage Investigation (ISI) to provide additional information regarding the role of storage. Information developed through all of these efforts will be considered to allow comprehensive comparisons of alternative WMS approaches.

Evaluation Framework

CALFED's WMS Evaluation Framework will: 1) document a comprehensive hierarchy of objectives for the CALFED Program, 2) establish well-defined measures of performance associated with the achievement of objectives, and 3) provide a basis for comparison of alternative long-term water management strategies.

Because so many Bay-Delta issues are inter-related, it is necessary to consider Program decisions in the context of effects on all Program objectives and solution principles. CALFED's "scorecard" of predicted performance measures will include estimates of regional quantities and costs of consumptive water supplies, regional water quality, water use efficiency and recycling measures, and regional water transfers. Secondary effects such as land use and employment changes and relative benefits towards ecosystem restoration goals will also be reported.

Initial WMS Alternatives

As a starting point, alternatives were formulated to describe three preliminary WMS approaches (described below). All three alternatives include significant new investments in water use efficiency measures, implementation of locally-controlled groundwater conjunctive use programs, transfer of water from agricultural to environmental uses (on a compensated basis), and shortages of water supplies in the driest years. As formulated, these alternatives represent choices in levels of investment in water use efficiency and recycling, surface storage, and measures to limit reallocation of agricultural water supplies. Evaluation of the scorecards of predicted performance measures for these initial alternatives will provide information on the tradeoffs associated with these choices.

Description of Initial WMS Alternatives

A) Emphasis on water use efficiency, recycling, and transfers with limited future increases in Delta exports.
B) Emphasis on new storage with priority distribution of new water supplies to the highest economic benefit (urban use).
C) Emphasis on new storage, water use efficiency, and recycling with measures to limit reallocation of agricultural water supplies to urban use.

Next Steps

Evaluation of the initial set of WMS alternatives will be available in April 2000 and will likely generate interest in evaluating additional alternatives. Likewise, information on performance of alternatives under other planning assumptions or information on other predicted measures of performance may be helpful. The existing Evaluation Framework is best applied to broad, fundamental decisions regarding CALFED's WMS; however, as CALFED moves to program implementation, the Evaluation Framework process can be adapted to address project-specific issues.

North of the Delta Offstream Storage

The California Department of Water Resources, in cooperation with CALFED, is studying the feasibility of four offstream storage sites north of the Delta: (1) the Sites Project, (2) the Colusa Project, (3) the Thomes-Newville Project, and (4) the Red Bank Project. Offstream storage involves diverting water out of a river and transporting it through canals to a storage site that may be miles away from the water source. The offstream storage site is typically on a small stream that does not significantly contribute to the water supply of the reservoir. Preliminary studies of North of the Delta offstream storage opportunities are summarized below

Floodflows of the Colusa Basin Drain, the Sacramento River, and local tributaries are potential sources of water supply for the Sites and Colusa Projects near Maxwell. Using the Colusa Basin Drain floodflows would reduce local flooding in the Colusa Basin. A 1.2-million-acre-foot Sites Reservoir could be formed by constructing dams on Stone Corral Creek and Funks Creek. A larger 1.8-MAF Sites Reservoir would require construction of nine additional saddle dams along the southern edge of Logan Creek watershed. Colusa Reservoir is a 3.0 MAF proposal that would include the area inundated by the 1.8 MAF Sites Reservoir, plus the adjacent watersheds to the north: Logan and Hunter Creeks. Most of the land in this area is now used for grazing or dry-farming grain because little water is available for summer irrigation.

The Thomes-Newville Project, upstream of Black Butte Reservoir, would be formed by constructing a dam on Stony Creek and a small saddle dam at Burrows Gap. An elliptical shaped reservoir would hold between 1.9 and 3.0 MAF of water, which would be supplied by Stony Creek, Thomes Creek,-other local tributaries and the Sacramento River.

The Red Bank Project near Red Bluff would be formed by constructing two dams to create 350,000 AF of storage in Dippingvat Reservoir on South Fork Cottonwood Creek and Schoenfield Reservoir on Red Bank Creek. This project would provide short-term storage of floodflows in Dippingvat, which would then be diverted to Schoenfield, the main storage reservoir. Since the initiation of this study, CALFED has recommended eliminating the Dippingvat Reservoir component of this project which reduces the likelihood that the Red Bank Project will be feasible.

Storing water in offstream reservoirs can provide water supply benefits and improve the timing of its availability for multiple uses in an environmentally sensitive manner. Storing water during times of high flow and low environmental impact would help provide flood control benefits, increased water, management flexibility, and improve Delta water quality during dry periods when conflicts over available water supplies are most pronounced.

Offstream storage north of the Delta would enable water to be diverted and stored during winter and early spring, when Sacramento River and local streamflows are highest, to minimize impacts on fish migration. Then, from May through October, water from the reservoir could be released for irrigation and wetlands in Colusa Basin in exchange for diversions from the Sacramento River. Such an exchange program will increase early summer storage in Shasta Lake which will contribute to cooler water for winter-run salmon, reduce diversions from the Sacramento River during the irrigation season, could reduce Sacramento fishery impacts.

Phase I studies include extensive field surveys of environmental resources, geological, seismic and foundation studies, potential environmental impacts, and preliminary engineering feasibility.. Phase II will begin in mid-2000 and will include preparation ofenvironmental documentation, and the permits necessary to construct the most feasible project, if one is identified.

A technical advisory group consisting of representatives of various agencies, interest groups, and environmental organizations meets regularly to review the work and advise DWR regarding the progress of these studies. Public workshops and meetings are scheduled to inform the public about the status and details of the studies and to receive comments.

In-Delta and Off-Aqueduct Storage

CALFED agencies are studying in-Delta and off-aqueduct storage sites adjacent to State and federal aqueducts south of the Delta as part of the Integrated Storage Investigations. Four alternative In Delta storage configurations and four Off-Aqueduct reservoir sites are being evaluated for their potential to restore the overall health of the San Francisco Bay-Delta estuary and develop long-term approaches to provide reliable water supplies to cities, farms, and the environment.

In-Delta Storage
Storage projects within the Sacramento-San Joaquin Delta are being evaluated as potential projects to provide water management flexibility and ecosystem benefits. One potential project consists of converting three Delta islands -Bacon, Woodward, and Victoria Islands - into storage sites. Two configurations are under consideration: one would convert the three islands into separate storage areas connected by siphons beneath the Delta channels that currently separate the islands; and the second would combine the three islands into a single storage site, eliminating the need for siphons to connect the islands. Both configurations would convey the stored water from the Delta to Clifton Court Forebay through siphons beneath Old River. The proposed storage capacities are 216,000 acre-feet if the three islands are maintained as separate storage facilities and 219,000 acre-feet for the combined storage facility.

A third in-Delta storage alternative being considered is a Southeast Delta Island project consisting of McDonald Tract, Lower and Upper Jones Tract, and Victoria Island. The combined storage capacity of these four islands is 391,000 acre-feet and provides the largest storage size of the three in-Delta proposals.

The U.S. Bureau of Reclamation is interested in another in-Delta project proposed by a private group called Delta Wetlands. This project involves four islands: Bacon Island and Webb Tract as reservoirs, and Bouldin Island and Holland Tract as wetlands and wildlife habitat. The total storage capacity of the reservoir sites is an estimated 238,000 acre-feet. Delta Wetlands is preparing an Environmental Impact Report for their proposed project; the EIR is expected to be completed in 2001. In-Delta storage has the potential to provide operational flexibility to enhance water supply reliability and ecosystem benefits. Potential impacts that must be studied in further detail include degraded water quality from organic carbon compounds formed by flooding peat soils, loss of agricultural land, seepage on adjacent islands, and levee stability concerns.

Off-Aqueduct Storage
Four off-aqueduct storage sites located near the California Aqueduct and Delta-Mendota Canal are also being evaluated. Studies will assess the potential to enhance operational flexibility by providing capabilities to export water from the Delta when optimal biological and water quality conditions occur.

One project under consideration is enlargement of the existing Los Vaqueros Reservoir, an offstream facility completed in 1998 by the Contra Costa Water District. The study will evaluate the feasibility of increasing the storage capacity of Los Vaqueros Reservoir from 100,000 acre-feet up to 1,065,000 acre-feet. The project would be operated to provide flexibility for Delta export operations in addition to meeting water supply needs and improving water quality in the San Francisco Bay region.

Three other off-aqueduct reservoirs south of the Delta are being evaluated: Ingram Canyon Reservoir (300,000 to 1,000,000 af) in Stanislaus County, Quinto Creek Reservoir (300,000 to 400,000 af) in Merced and Stanislaus Counties, and Panoche Reservoir (160,000 to 1,500,000 af)* San Benito/Fresno County

Phase I studies for the in-Delta and Off-Aqueduct projects are underway and will be completed by mid-2000. Each study will include project descriptions, development of alternatives, operations studies, preliminary cost estimates, and pre-feasibility evaluations of geology, biological resources, and water quality impacts. Phase II studies would include feasibility study, preparation of environmental documentation, public input, and permits necessary to construct the most feasible project, if one is identified.

E-038829

Onstream Storage Enlargement

To meet the Central Valley Project service area water needs and to provide adequate water for the Sacramento-San Joaquin Delta Estuary, the U.S. Bureau of Reclamation is studying two onstream storage enlargement projects: Shasta Lake on the Sacramento River and Millerton Reservoir on the San Joaquin River. Initial studies of this element of the Integrated Storage Investigations provide the following information.

Shasta Lake Enlargement
Three options were studied to illustrate the potential costs, technical issues, and impacts associated with dam raises of 6.5, 102.5, and 202.5 feet. These options would provide from about 300,000 to 9,000,000 acre-feet of additional water storage and would inundate from 2,000 to 30,000 additional acres of land.

Three relocation and replacement categories were considered: transportation routes, recreational facilities, and communities. The lowest raise option, where the maximum water level would be at about 1,075.5, would have minimal effects on existing structures. Detailed topographic surveys will be completed to verify the impacts on existing facilities.

Estimated costs range from about $122 million for a 6.5-foot raise to $5.8 billion for a 202.5-foot raise, including mitigation costs. The cost per acre-foot of storage ranges from about $420 for a 6.5-foot raise to $990 for a 102.5-foot raise. The 202.5-foot raise was $620 per acre-foot.

Enlargement of the dam would increase the active conservation storage space to capture floodwater, which would then be available to meet downstream beneficial uses, including water supply and power generation.

The lowest raise option - a structural raise of 6.5 feet to the crest height of the existing dam warrants continued study. The new crest elevation would be 1,084 feet; the total reservoir capacity would be 4.8 million acre-feet, a storage capacity increase of 290,000 acre-feet; and the new maximum water surface elevation would be 1,075.5, an additional 8.5 feet of water in the reservoir.

The USBR is planning a feasibility study that would include refining engineering design and cost estimates, defining operational opportunities in the context of statewide water issues and programs, and evaluating benefits optimized in relation to meeting multiple demands. Opportunities for public input will be provided throughout the planning process.

Millerton Reservoir Enlargement
Modifying Friant Dam to enlarge Millerton Reservoir has the potential to improve flood control, water supply reliability, and ecosystem restoration. Given the potential for multiple benefits, the USBR will initiate a prefeasibility evaluation of this project in early 2000. A feasibility study will be initiated for the Millerton Reservoir enlargement, if the project appears feasible during the prefeasibility evaluation.

Surface and Ground Water Conjunctive Management

The goal of the Integrated Storage Investigations Surface and Ground Water Conjunctive Management program is to assist local agencies with improving regional water supply reliability by increasing the coordinated use of surface and ground water. Working cooperatively, local agencies, basin stakeholders, and the Department of Water Resources on behalf of CALFED, will conduct a technical, economic, social, and environmental feasibility evaluation of possible conjunctive management projects within each basin. Full-scale project development and implementation will proceed in basins that demonstrate local approval of feasible alternatives, subject to funding availability. The program has the following principles:

- Local planning process
- Local control of proposed projects
- Voluntary implementation of projects
- Priority for in-basin water needs
- Compensation for out-of-basin transfers
- Basin-wide planning and monitoring

Financial Assistance

In addition to providing planning and technical assistance, financial assistance is available for conjunctive water management project development and implementation. Funding is available from federal and State budget appropriations and State bond measures for feasibility studies, development of comprehensive groundwater and subsidence monitoring programs, development of basin-specific groundwater flow and quality models, and pilot or full-scale project design and construction.

Program Implementation

The Conjunctive Management program will be carried out regionally, developing the best possible approach for each basin. The program will be conducted in three phases. The process is initiated with the signing of a Memorandum of Understanding between DWR and the county, water district or local agency having basin-wide groundwater management

responsibilities. The MOU is a general agreement between the parties to cooperate in the evaluation of the groundwater resources and development of conjunctive management alternatives.

Phase I

During Phase I, a local advisory panel, comprised of civic and technical leaders and other interested parties, will be established for each basin. This panel will guide the development of basin management objectives, bringing together stakeholders to discuss concerns and provide a forum for sharing water management information. This process will result in a basin assessment report (programmatic feasibility study) for each basin, identifying environmental and third-party impacts, future in-basin water needs, long term monitoring needs, and potential conjunctive water management opportunities.

Phase II

Phase II includes project-specific evaluations comprised of feasibility studies, environmental documentation, permit requirements, and development and implementation of monitoring program, and basin wide modeling if needed. For some basins these efforts will begin simultaneously with Phase I.

Phase III

Phase III involves full-scale project implementation.

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Hydroelectric Facilities Reoperation

One of many water management strategies being evaluated as part of the Integrated Storage Investigations is the potential to obtain water supply benefits from reoperation of existing facilities originally constructed and operated to generate hydroelectric power. In 1996, California adopted an aggressive plan to restructure the regulation of the State's electric industry to establish a more competitive electric system. This plan triggered evaluations of potential divestiture of existing hydroelectric generation facilities and their associated reservoirs. The California Legislature is interested in the potential impacts or opportunities divestiture may present, including the potential water supply and environmental benefits that may result from the reoperation of these facilities.

Pacific Gas and Electric's Hydroelectric System

PG&E's hydroelectric generation system comprises a majority of such facilities in California. In September 1999, Pacific Gas and Electric Company filed an application with the California Public Utilities Commission to divest its hydroelectric generating facilities and related assets. After the Central Valley Project and State Water Project, PG&E is the largest owner of both reservoir storage and hydroelectric capacity in California. The utility owns and operates over 2.3 million acre-feet of reservoir storage in 100 reservoirs with almost 4,000 megawatts of generating capacity. The system's 110 generating units at 68 powerhouses provide hydroelectric generation from 16 river basins, mostly in California's Sierra Nevada mountain range. The twenty largest reservoirs account for over 95 percent of the storage capacity of the PG&E system. These relatively larger reservoirs provide the utility with the ability to store water during high runoff and low power demand periods and then later release water for hydropower production during low runoff and high power demand periods.

Reoperation Study Approach

Prior to PG&E's application to divest, CALFED began a study of potential water supply and ecosystem benefits available through reoperation of the utility's hydroelectric facilities. Since PG&E owns a majority of hydroelectric generation facilities in river basins tributary to the Delta, the initial reoperation studies focussed on the PG&E system. These studies provided a preliminary assessment of the scale of benefits available through reoperation, in general. The study further focused on potential reoperation of Lake Almanor, in Plumas County, the largest of PG&E's reservoirs, with storage capacity over 1.1 million acre-feet. Almanor is the only reservoir of the PG&E hydroelectric system that is regularly operated for year to year carry over storage.

Three primary objectives of the study were to quantify potential reoperation benefits for: 1) local water supply reliability, 2) system-wide water supply reliability, and 3) changes in the timing of flows for environmental enhancement. Benefits, in thousands of acre-feet, related to reoperation of Lake Almanor were provided by an operation planning model of the reservoir and then adjustments to the input hydrology of a Bay-Delta watershed operations simulation model, which then provided a quantitative assessment of system-wide reliability improvement and environmental enhancement. Finally, a PG&E system benefit was estimated by extrapolating the Lake Almanor results to the twenty largest PG&E reservoirs, based on storage available for reoperation within the Bay-Delta watershed.

Reoperation Study Results

Study results indicate that the system wide water supply benefit from reoperation of the PG&E reservoir is limited. Therefore, CALFED does not propose to further study PG&E hydropower reoperation for system-wide water supply. CALFED also recommends that further evaluation of hydroelectric facilities to improve local water supply reliability should be pursued at the initiative of local water interests. Studies indicate that local water supply benefits may be available and local entities may pursue these studies further, to the extent that the reoperation does not conflict with CALFED objectives. However, the potential for reoperation for environmental purposes remains an option and CALFED may consider more detailed studies in the future, subject to better defined needs of water for environmental enhancement.

E-038832

Fish Barrier Removal

This element of the Integrated Storage Investigations Program will evaluate the potential to modify or remove instream barriers that impede migration and spawning of anadromous fish species within the Central Valley of California. The program will utilize interdisciplinary teams of fish and wildlife biologists, planners, river hydrologists, engineers, and economists to conduct program activities including migration barrier inventories, identifying and evaluating fish passage opportunities, environmental documentation, feasibility studies, and implementation. Coordination and consultation with stakeholders and the public will ensure that planning and implementation of the program considers all feasible opportunities to optimize fish passage while providing continuous, reliable water supplies for water users. The scope of this program includes:

Phase I

Conduct an inventory of instream barriers that have impeded fish to access of historical spawning and rearing habitat for anadromous salmon and steelhead in the Sacramento-San Joaquin river systems of the Central Valley. This inventory will include all migration barriers up to the major valley rim dams. A database of environmental and barrier data will be created and linked to a Geographic Information System to facilitate mapping as well as alternatives analyses.

This program will document completed and current barrier removal projects that have contributed to improved migration passage and access to spawning and rearing habitat, increases in natural fish production, and habitat improvement in the Central Valley.

An interagency and a stakeholder review team will be formed to identify and resolve potential ecological, social and economic issues of migration barrier removal or modification. The formation of review teams will facilitate developing complete information on barrier removal options and evaluating potential impacts while maintaining open dialog for cooperation in achieving mutually beneficial goals.

Criteria to evaluate potential barriers will be developed through guidance and review from interagency and stakeholder participants. Criteria will provide the framework for comparing individual barriers to the objectives of the program and the means to define priorities. The program will evaluate the potential ecological and socio-economic benefits or impacts of barrier removal and based on developed criteria, prioritize barriers to study further. Phase I will include preparation of a report on the barrier inventory and initial evaluation based on the developed criteria and prioritization process.

Phase II

Continue to evaluate and prioritize projects based on their near-term feasibility and potential for multiple benefits as information is developed. Provide information through focused cooperative stakeholder and agency workshops and public hearings.

Complete feasibility studies of the most promising projects. These analyses will include more in-depth and refined assessment of the potential benefits, costs, and socioeconomic issues identified during Phase I investigations. Analyses of benefits and impacts will include assessment of riverine aquatic habitat availability, quality and quantity of habitat, fish production potential, water supply, power generation, or wildlife needs, recreation, and effects on flood control. The program will produce feasibility study reports for selected barriers and will complete preliminary project planning, alternative analyses, design, and cost estimates.

Phase II will include complete environmental impact analyses and obtain necessary permits to implement the selected projects based on findings of the feasibility study reports.

Phase III

Complete engineering and design work and refine cost estimates. Implement the selected projects.

All phases of the Fish Barrier Removal Program will include public and stakeholder involvement as a priority function. Information exchange and program development forums will include public workshops, cooperative meetings with stakeholders, water users, and agency representatives.